CLAIMS
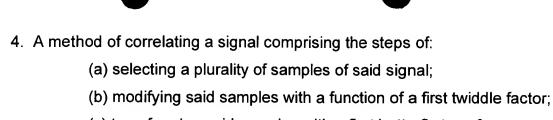
The invention claimed is:

1. A method of correlating a signal comprising the steps of:

    (a) selecting a plurality of samples of said signal;

    (b) modifying a first butterfly transform with a first twiddle factor;

    (c) transforming said samples with said modified first butterfly transform;

    (d) modifying a second butterfly transform with a second twiddle factor;

    (e) transforming an output of said of said first butterfly transform with said modified second butterfly transform;

    (f) modifying a third butterfly transform with a third twiddle factor;

    (g) transforming an output of said second butterfly transform with said modified third butterfly transform;

    (h) selecting a largest output of said third butterfly transform; and

    (i) repeating steps (a) - (h) for a plurality of values of said first, said second, and said third twiddle factors.

2. The method of claim 1 wherein a value of said first, said second and said third twiddle factors are selected from a twiddle factor set comprising values 0, π/8, π/4, and 3π/8.

3. The method of claim 1 wherein the step of selecting a largest output of said third butterfly transform comprises the steps of:

    (a) storing a first output of said third butterfly transform;

    (b) comparing a second output of said third butterfly transform to said stored first output; and

    (c) replacing said stored first output with said second output if said second output is larger than said stored first output.

4. A method of correlating a signal comprising the steps of:

    (a) selecting a plurality of samples of said signal;

    (b) modifying said samples with a function of a first twiddle factor;

    (c) transforming said samples with a first butterfly transform;

    (d) modifying an output of said first butterfly transform with a function of a second twiddle factor;

    (e) transforming said modified first butterfly output with a second butterfly transform;

    (f) modifying an output of said second butterfly transform with a function of a third twiddle factor;

    (g) transforming said modified second butterfly output with a third butterfly transform;

    (h) selecting a largest output of said third butterfly transform; and

    (i) repeating steps (a) - (h) for a plurality of values of said first, said second, and said third twiddle factors.

5. The method of claim 4 wherein a value of said first, said second and said third twiddle factors are selected from a twiddle factor set comprising values 0, $\pi/8$, $\pi/4$, and $3\pi/8$.

6. The method of claim 4 wherein the step of selecting a largest output of said third butterfly transform comprises the steps of:

    (a) storing a first output of said third butterfly transform;

    (b) comparing a second output of said third butterfly transform to said stored first output; and

    (c) replacing said stored first output with said second output if said second output is larger than said stored first output.

7. A correlator for a direct sequence spread spectrum signal comprising:

    (a) a weighting device to modify a sample of said signal as a function of a

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first twiddle factor;
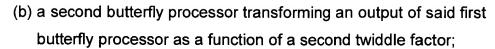
(b) a first butterfly processor transforming a pair of modified samples of said signal;

(c) a second weighting device to modify an output of said first butterfly processor as a function of a second twiddle factor;

(d) a second butterfly processor transforming said modified output of said first butterfly processor;

(e) a third weighting device to modify an output of said second butterfly processor as a function of a third twiddle factor;

(f) a third butterfly processor transforming said weighted output of said second butterfly processor;

(g) a largest modulus selector to identify a largest output of said third butterfly processor; and

(h) a twiddle factor indexer successively varying a value of at least one of said first, said second, and said third twiddle factors.

8. The apparatus of claim 7 wherein said twiddle factor indexer varies a value of at least one of said first, said second and said third twiddle factors with one of a value selected from a twiddle factor set comprising values 0, $\pi/8$, $\pi/4$, and $3\pi/8$.

9. The apparatus of claim 7 wherein said largest modulus selector comprises:

(a) a comparator for comparing a first and a second output of said third butterfly processor; and

(b) a register for storing a largest of said first and said second outputs of said third butterfly processor.

10. A correlator for a direct sequence spread spectrum signal comprising:

(a) a first butterfly processor transforming a pair of samples of said signal as a function of a first twiddle factor;

(b) a second butterfly processor transforming an output of said first butterfly processor as a function of a second twiddle factor;

(c) a third butterfly processor transforming an output of said second butterfly processor as a function of a third twiddle factor;

5 (d) a largest modulus selector to identify a largest output of said third butterfly processor; and

(e) a twiddle factor indexer varying in succession a value of at least one of said first, said second, and said third twiddle factors.

10 11. The apparatus of claim 10 wherein said twiddle factor indexer varies a value of at least one of said first, said second and said third twiddle factors with one of a value selected from a twiddle factor set comprising values 0, $\pi/8$, $\pi/4$, and $3\pi/8$.

15 12. The apparatus of claim 10 wherein said largest modulus selector comprises:

(a) a comparator for comparing a first and a second output of said third butterfly processor; and

(b) a register for storing a largest of said first and said second outputs of said third butterfly processor.